CLAIMS

What is claimed is:

1. A semiconductor device comprising:

a substrate layer comprising a first dopant density;

an epitaxial layer comprising a second dopant density formed on the substrate layer; and

a semiconductor switch formed on the epitaxial layer, wherein the semiconductor switch comprises an active region of the semiconductor device;

wherein a first thickness of the epitaxial layer in the active region is less than a second thickness of the epitaxial layer in a termination region formed peripherally to the active region.

2. The semiconductor device of claim 1 wherein the semiconductor switch comprises a gate electrode formed on an upper surface of the epitaxial layer and the first thickness is a distance between the upper surface of the epitaxial layer proximate the gate electrode and an upper surface of the substrate layer.

3. The semiconductor device of claim 2 wherein the second thickness is a distance between the upper surface of the epitaxial layer in the termination region and the upper surface of the substrate layer.

4. A method of forming a semiconductor device comprising:

A. forming a mask over a substrate layer comprising a first semiconductor material of a first thickness and having a first dopant density, wherein the mask covers a first portion of the substrate layer;

B. removing the first semiconductor material from the portion of the substrate not covered by the mask to reduce a second portion of the substrate layer to a second thickness;

C. growing an epitaxial layer over the first and second portions of the substrate layer, such that the epitaxial layer comprises a substantially planar surface opposite a surface of the epitaxial layer which is in contact with the substrate layer, wherein the epitaxial layer includes a first epitaxial portion, proximate the first portion of the substrate layer, having a first epitaxial thickness and a second epitaxial portion, proximate the second portion of the substrate layer, having a second epitaxial thickness; and

D. forming a semiconductor switch on the substantially planar surface of the epitaxial layer proximate the second epitaxial portion;

wherein the first epitaxial thickness is substantially less than the second epitaxial thickness.

5. A method of making a semiconductor switching device comprising a substrate layer and an epitaxial layer having at least a portion lying in the active and termination regions of the device and having a desired breakdown voltage and on-resistance, comprising:

forming the epitaxial layer such that the epitaxial layer in the active region of the device is significantly thinner than the epitaxial layer in the termination region so as increase its breakdown voltage relative to its on-resistance.

6. The method of claim 5, wherein the epitaxial layer in the active region of the device is formed so as to be significantly thinner than the epitaxial layer in the termination region so that the switching device operates at a higher breakdown voltage without increasing on-resistance of the switching device.

7. The method of claim 5, wherein the epitaxial layer in the active region of the device is formed so as to be significantly thinner than the epitaxial layer in the termination region so that the on resistance can be lowered while maintaining a desired breakdown voltage.